Briefing on Outage Management System Independent Verification and Validation Final Report (Phase 1 and 2)

June 28, 2023

STATUS OF PSEG LONG ISLAND OMS REDEPLOYMENT

PSEG Long Island redeployed CGI Outage Management System (OMS) v6.7.8 into production on February 6, 2022

- OMS v6.7 failed during Tropical Storm Isaias in August 2020

- Smart meter integration into OMS was deployed in June 2022. Performance (stress) testing on OMS-AMI integration was completed in September 2022

- PSEG Long Island reports that the system is functioning as expected

- The cost to remediate the OMS since its August 2020 failure exceeded $47 million

- **LIPA IV&V Team consisting of LIPA internal staff and consultants initiated independent verification and validation (IV&V) of the system through review and testing**

TECHNICAL APPROACH

The overall objective of LIPA's IV&V is to reduce risk to LIPA and its customers. The IV&V undertook the following key activities:

- Meetings
- Interviews with PSEG Long Island staff and consultants
- Document Reviews
- Code Reviews
- Analysis
- Observation and Monitoring
- Functional Testing
- Performance (Stress) Testing

IV&V SCOPE

The overall objective of LIPA's IV&V is to reduce risk to LIPA and its customers. The specific scope of the IV&V review includes:

- Review of OMS design specifications, configurations, and interface implementations.
- Review of the design of PSEG Long Island's functional tests to ensure the tests are adequate to evaluate whether OMS v 6.7.8 complies with functional requirements.
- Running a sample of PSEG Long Island's functional tests to independently repeat and verify test results. Based on those sample results, running all of PSEG Long Island's functional tests until all tests were successful.
- Independent ad-hoc testing, including Positive Testing, Negative Testing, Boundary Value Testing, and End-to-End Testing.
- Review of custom code written by PSEG Long Island and its consultants, including the implementation of the asynchronous queueing mechanism (async queue) for the Enterprise Service Bus (ESB), and the duplicate outage detection logic.
- Monitoring and analysis of PSEG Long Island's performance tests.
- Review of PSEG Long Islands Performance Testing Storm Scenario and Data Model.
- Revise PSEG Long Island's Performance Testing Data Model to better capture expected storm scenarios.
- Independently run a Performance Test using the revised model.

FUNCTIONAL TESTING STATUS

The IV&V Team ran each of PSEG Long Island's functional tests, sent failed tests to PSEG Long Island for resolution, and re-tested once PSEG Long Island reported the issue as fixed or provided updated test scripts, until the test could be closed:

	Test Points	Tests Run	Pass %	*Failed to Run %
July	535	358 (67%)	229 (64%)	129 (36%)
September	642	581 (90%)	279 (48%)	302 (52%)
November	646	616 (95%)	421 (68%)	143 (23%)
December	646	645 (99%)	451 (70%)	141 (22%)
January	646	645 (99%)	463 (72%)	118 (18%)
February	646	645 (99%)	483 (75%)	59 (9%)
March	645	644 (99%)	526 (82%)	12 (2%)
April	**645**	**644 (99%)**	**527 (82%)**	**11 (2%)**

- LIPA IV&V Team ran 645 tests and 527 eventually passed. 107 failed tests were removed by PSEG Long Island because the business identified them as obsolete. 11 tests remain pending because the current test environment is not set up to execute these scripts.

PERFORMANCE TESTING STATUS

In 2023, LIPA and PSEG Long Island conducted several performance tests with intermittent successes and failures:

Date	Test	Outcome
Jan 12, 2023	LIPA executed a dry-run performance test simulating Isaias conditions.	OMS call processing module failed and could not be recovered => Overall test failed
Jan 18, 2023	LIPA re-executed its dry-run performance test simulating Isaias conditions.	Test passed without major hiccups
April 26, 2023	IV&V 5-Hour Performance Smoke Test	Test passed
April 27, 2023	IV&V 5-Hour Performance Smoke Test	Test passed
June 14, 2023	90% Customer Out DPS Formal Performance Test	OMS call processing module failed again, but was re-startable by rebooting services

GENERAL FINDINGS

Finding 1.   Planning was deficient

Finding 2.   PSEG Long Island does not have sufficient internal technical resources

Finding 3.   Vendor Management was deficient

Finding 4.   Cost Control and Management was poor

Finding 5.   Test planning was deficient

Finding 6.   Test script development and management was deficient

Finding 7.   Test execution was deficient

Finding 8.   Requirements Management processes are inadequate

Finding 9.   Configuration and Release Management processes are inadequate

For more information about the findings and recommendations, please see the full written IV&V report

GENERAL FINDINGS   (CONT)

Finding 10.   System and process documentation practices are poor

Finding 11.   The root cause of the failures during OMS was not concretely identified, but the risk of occurrence was mitigated

Finding 12.   Some performance tests have exhibited sporadic, non-reproducible and potentially critical issues

RECOMMENDATIONS

Governance

Recommendation 1: PSEG Long Island should develop clear and documented policies on IT systems governance. The application and enforcement of these policies must be the responsibility of PSEG Long Island staff, not consultants.

Recommendation 2: Business ownership of the systems should be guard-railed by clear and well-enforced policies

Training

Recommendation 3: PSEG Long Island should develop a comprehensive training program for its technical and line of business staff in the following areas:
- Technology project management
- Vendor management
- Requirements engineering and management
- Configuration management
- System documentation best practices
- Test management (including test design, scripting, automation, metrics and test environment management)

RECOMMENDATIONS (CONT)

Staffing and Employee Retention

Recommendation 4: PSEG Long Island should prioritize proactive employee recruitment strategies and reduce dependence on consultants by hiring more permanent staff

Recommendation 5: PSEG Long Island should be more proactive in employee retention

Vendor Management

Recommendation 6: PSEG Long Island should develop an enterprise-wide vendor management policy to establish clear performance expectations and accountability

Long term planning

Recommendation 7: PSEG Long Island should develop a long-term plan around the future of the current OMS system

Process Improvements

Recommendation 8: PSEG Long Island should use formal tracking of problems (in one place) using ITIL practices

Recommendation 9: PSEG Long Island should automate functional testing. PSEG Long Island should embark on a test automation initiative that, initially, aims to automate a large portion of the regression testing scripts

Recommendation 10: PSEG Long Island should develop focused project management processes

RECOMMENDATIONS (CONT)

Business Continuity Plans

Recommendation 11: PSEG Long Island should expand on the current Business Continuity Plans to make sure that they are consistent with industry best practices

IT Quality Control and Assurance

Recommendation 12: PSEG Long Island should review all their existing functional test scripts and re-test each script until all the tests pass on a "repeatable" basis

Recommendation 13: PSEG Long Island should focus on improving test management practices, which will involve staff training and appropriate use of Software Development Life Cycle (SDLC) and test management tools

Recommendation 14: PSEG Long Island should ensure that system, integration, and user acceptance testing follows a defined cadence and is organized accordingly

NEXT STEPS

- **Review the findings and recommendations from this report with the Department of Public Service and return to the Board's next meeting for Proposed Board Recommendations, which would then be tracked until remediated**

- **PSEG Long Island should continue its efforts in identifying the root cause of the intermittent call processing defects within the OMS system**

- **LIPA IV&V Team will continue to monitor PSEG Long Island's progress in its effort to make OMS considerably more robust**

Discussion

Questions?

Independent Verification and Validation: Findings and Recommendations on PSEG Long Island's Outage Management Systems Remediation and Re-Test

LIPA
Long Island Power Authority

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INTRODUCTION

Overview

In February 2022, PSEG Long Island deployed an updated version (v 6.7.8) of its CGI Outage Management System (OMS) with a number of major corrective actions (including the deployment of new hardware) and reported that the system was functioning as expected. A previous deployment of the OMS v 6.7 had failed during Tropical Storm Isaias, with severe consequences for LIPA customers, and PSEG Long Island had subsequently reverted to running OMS v 5.5.

Following the 2022 redeployment of a remediated, re-platformed OMS v 6.7.8, LIPA initiated an Independent Validation and Verification (IV&V) of the OMS and associated systems, sub-systems and internal processes, with the overall objective of reducing risk to LIPA and its customers. **The primary goal for this IV&V effort was to independently evaluate the functional and performance tests developed by PSEG Long Island, and to confirm their successful execution. A secondary goal was to evaluate PSEG Long Island's internal business processes, including but not limited to those related to testing, quality assurance, project management, and vendor management; and verify whether they are aligned with industry standard practices.**

The LIPA IV&V Team, consisting of LIPA internal staff and consultants, has been consistently presenting summary findings to the LIPA Board at each meeting. This document represents LIPA's Final Report on the IV&V Team's activities, findings, and recommendations.

Background

Tropical Storm Isaias and the Isaias Task Force

On Tuesday, August 4, 2020, Tropical Storm Isaias hit Nassau and Suffolk counties and the Rockaways with rain and wind gusts up to 70 miles per hour. The resulting damage to the electrical system resulted in approximately 646,000 customer outages. It took PSEG Long Island five days to restore 75% of customers and eight days to restore 99% of customers.

On the afternoon of the storm, PSEG Long Island's OMS, used to manage restoration efforts, estimate restoration times, and provide restoration information to customers, failed. PSEG Long Island's inbound voice telephony infrastructure became overloaded, and thousands of customers received busy signals when calling the utility to report an outage. **All customer communications systems experienced issues, and many customers were unable to contact PSEG Long Island by any communication channel. Estimated Times of Restoration (ETRs) provided to customers were repeatedly inaccurate.** Some customers received a dozen or more inaccurate restoration times, and restoration estimates were extended by as many as seven days.

On August 5, LIPA's Chief Executive Officer initiated an independent investigation of the circumstances and root causes that led to the well-documented lapses in PSEG Long Island's storm response. The Task Force was charged with providing actionable recommendations and overseeing PSEG Long Island's remediation activities.

The Task Force presented a 30-Day Report to the Board on September 23, 2020 and a 90-Day Report to the Board on November 18, 2020. Because of the urgency of the immediate threat of another major storm, the 30-Day Report focused on the failures of PSEG Long Island's information technology and communication systems and their proximate causes. The 90-Day Report expanded on the findings of

the 30-Day Report and further concluded that systemic management shortcomings were the root cause of PSEG Long Island's failures during the storm.

The 30-Day and 90-Day reports collectively provided 85 actionable recommendations that were designed to, among other things, (i) change management incentives and accountabilities; (ii) reform information technology and emergency management; and (iii) strengthen LIPA's oversight. The Board, in November 2020, directed PSEG Long Island to implement the Task Force Recommendations, and LIPA has reported to the Board on the status of each recommendation in Quarterly Reports, the most recent of which was issued on June 28, 2023.

Many of the IT system recommendations addressed remediation of the OMS, resulting in the following key LIPA requirements:

- Systematically analyze and test the failure modes of the system to identify the true root causes of the observed defects.
- Ensure that test designs comprehensively and completely exercise all end-to-end processes (across each channel) as might be encountered in a future storm scenario like Isaias or worse.
- Focus on fixing OMS v 6.7 or later and not the obsolete and unsupported v 5.5 of the system.
- Build robust Business Continuity Plans (BCPs) as a contingency measure.

LIPA has defined success as:

- Deployment of a stable, vendor-supported, industry-standard system that will provide the functionality demanded from an efficient and effective response plan.
- A fully tested system that will perform efficiently and effectively under load scenarios predicted in this new climate-challenged world.
- Well-designed, reliable, and thoroughly exercised BCPs that can be put in motion if the primary systems fail.

History and Current Status of the OMS

In June 2020, PSEG Long Island upgraded the OMS from v 5.5 to v 6.7. In the immediate aftermath of Tropical Storm Isaias, PSEG Long Island abandoned the recently installed v 6.7 in favor of reverting to v 5.5, on the stated premise that the older version could prove to be more stable.

The Isaias Task Force subsequently discovered, as documented in the 90-Day Report, that **the OMS had been experiencing instability and performance issues since the June 2020 upgrade and was already failing before Tropical Storm Isaias arrived.**

After over two (2) years and multiple delays, PSEG Long Island has now completed remediation of the OMS and finally has a working version of OMS with current software and hardware. However, **the path to this point has not been smooth and has demonstrated significant deficiencies in PSEG Long Island's processes and approach.** Some key activities and milestones are briefly recapped below.

- For the first nine months, PSEG Long Island's remediation efforts were largely targeted to v 5.5, which was an outdated and unsupported version running on obsolete infrastructure.
- PSEG Long Island pursued a "re-platform" strategy to return to the latest OMS application version, instead of focusing efforts on identifying the root causes of failure in OMS v 6.7, as

LIPA had recommended. The strategy entailed deploying new hardware with sufficient excess capacity to, hopefully, alleviate issues under heavy load.

- PSEG Long Island originally planned to deploy a remediated v 6.7 on new hardware prior to the 2021 Atlantic Hurricane season. PSEG Long Island was unable to complete this re-platforming along their proposed timeline, and in May 2021, deferred the upgrade until after the 2021 storm season.

- After deferring the upgrade, PSEG Long Island focused on remediation and end-to-end performance testing of v 5.5. PSEG Long Island conducted a v 5.5 End-to-End Performance Test in April 2021 that was unsatisfactory, and then another test in late May 2021 that it deemed successful.

- Along with other fixes, the May 2021 test incorporated remediations to protect the OMS from heavy load, including duplicate outage detection logic and an asynchronous queueing mechanism (async queue) for the Enterprise Service Bus (ESB) that controls the rate at which calls are sent to the OMS.

- Following the May 2021 test, PSEG Long Island focused on the v 6.7 project, which it planned to deploy in November 2021.

- PSEG Long Island subsequently delayed the planned deployment date to January 2022, due to issues that surfaced during initial performance testing; and then again extended the date to February 2022.

- PSEG Long Island finally deployed a remediated and re-platformed OMS v 6.7.8 with new hardware on February 6, 2022 - 18 months after Tropical Storm Isaias. PSEG Long Island reported that the deployment was successful, and LIPA initiated its IV&V.

- A key component of the remediations recommended by the Task Force was integration of Advanced Metering Infrastructure (AMI) into OMS, which provides several important storm management/restoration features. The integration, which required OMS v 6.7, was originally planned for completion by March 31, 2022.

- The AMI-OMS integration deployment was delayed, first to April 2022, then to May 2022, and was ultimately deployed on June 27, 2022. Performance testing of the integration was completed in September 2022.

- PSEG Long Island has now largely implemented the OMS remediations pursuant to the Task Force Recommendations in OMS v 6.7.8, though with significant delays, as illustrated in Figure 1.

- **While the specific root causes of the earlier failures were not identified, design changes that reduce the volume of calls to the OMS and limit the rate at which they are sent to the OMS should mitigate the risk of the OMS experiencing heavy load conditions under which the issues arose.**

- A number of performance tests have now been conducted on OMS v 6.7.8, by PSEG Long Island and the IV&V Team. **While the majority have been successful, at least three of these tests have exhibited unexplained and non-reproducible slowdowns and backlogs in the processing of reports**, including:
    - A December 12, 2022, test where the OMS call queue had significant backlogs starting in Hour 8 of the test, with queue size reaching up to eight times the normal peak volume and delays up to 4 hours.
    - A January 12, 2023 performance test where the system stopped processing outage reports completely.
    - A June 14, 2023 90% Customer Out DPS Formal Performance Test that had a similar Call Queue backlog build up. In this case, the system recovered after the background task for processing the calls was restarted.

This issue has not been reproducible (see Figure 3), and in the absence of a clearly identified root cause, it remains a significant concern that the system may have a critical issue that is exhibiting intermittently and has the potential to cause another catastrophic failure of the OMS.

Figure 1: OMS-Related ITF Recommendations

Rcm #[1]	Description	Start Date	Planned End Date	Actual End Date	Project Delay
3.2.2.3 (2022 IT-6)	Work with CGI to obtain and implement fixes for identified application defects, which could include upgrading to a more recent version of the OMS software	12/3/2020	3/31/2022	10/25/2022	7 months
3.2.2.4 (2022 IT-6)	Automate monitoring of OMS and CAD performance at the application level to detect application failures and give administrators an opportunity to adjust the configuration settings that affect performance	11/2/2020	3/31/2022	3/17/2023	11.5 months
3.2.2.5	Automate monitoring of the OMS and CAD at the infrastructure level to detect infrastructure failures and give administrators an opportunity to restore normal operating conditions.	11/23/2020	5/3/2021	2/11/2022	9 months
3.2.2.7	Automate monitoring of inbound outage reports to the OMS, to be able to detect and eliminate erroneous reports that may arrive from any source.	11/2/2020	5/3/2021	2/11/2022	9 months
3.2.2.8	Irrespective of whether the failure mode is corrected within the IVR, the OMS should have automated monitoring of data quality arriving from IVR to detect potentially duplicate or otherwise bad information.	11/2/2020	5/3/2021	2/18/2022	9.5 months

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[1] Some Board Recommendations were incorporated into the 2022 IT-6 metric, with new Due Dates to set achievable targets for already delayed projects. For these metric projects, the listed Planned End Dates are per the metric schedule (including approved exception requests), though some had previously approved PIPs with earlier planned end dates. Listed Start Dates are the actual start dates to the extent known, but there may be some variability.

3.2.2.9	The IVR and OMS communication protocol should be reviewed in detail and redesigned so that all messages between the two components are agreed, understood, verified to be operational and tested against error conditions such as sending duplicate outage reports.	11/2/2020	5/11/2021	2/6/2022	8 months
3.2.3.1	At the beginning of storm planning and throughout the storm, designate a system data administrator dedicated to monitor, on a continuous basis, the timeliness, accuracy, and integrity of the information coming from OMS to Kubra.	12/1/2020	3/22/2021	9/17/2021	5.5 months
3.2.4.3	Introduce the capability to quickly decouple the web and mobile apps from the OMS, so that when unresponsiveness is detected, alternate messaging can be provided to the customer and the OMS can be relieved of incoming transactional pressure.	4/7/2021	11/12/2021	2/11/2022	3 months
4.07	Ensure that the Municipal Portal is more resilient and prepare a backup Mode of Operation in case of OMS failure.	8/31/2020	8/16/2021	11/21/2022	15 months
4.12	Systematically test the OMS system to ensure that concrete root causes are identified and remedied. If the errors are due to system defects, then demand accountability from the system vendor for timely fixes. Ensure that root causes, not just symptoms, are addressed.	4/23/2021	2/28/2022	4/13/2022[2]	1.5 months
4.13 (2022 IT-6)	After the OMS faults are diagnosed and repaired, thoroughly stress-test the CAD system and the ESB to ensure there are no independent defects affecting either system	1/07/2021	3/31/2022	10/25/2022	7 months
4.15 (2022 IT-6)	Performance test OMS and "feeder" systems to establish peak capacity	1/13/2021	3/31/2022	Open	> 15 months
4.17	Re-architect the inter-system message queuing applications for greater dynamic stability under highly demanding workloads.	11/13/2020	7/9/2021	2/15/2022	8 months
4.18 (2022 IT-6)	Monitor application performance and error logs of all mission critical application systems, such as OMS, CAD, SCADA, ESB, etc.	2021Q1	3/31/2022	3/17/2023	12 months
4.19	As part of storm preparation, ensure that all application errors and debug conditions have been cleared and the system is operating normally.	1/7/2021	5/3/2021	2/11/2022	9 months

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[2] While the concrete root causes were not identified, LIPA accepted the recommendation as completed since the issue had effectively been remediated by ESB level design changes that protect the OMS from the heavy load conditions under which the issues arise.

5.4.2b (2022 IT-6)	Accelerating the deployment of smart meters and the full integration of smart meters with OMS so that outage reports will be available to OMS more rapidly and embedded outages (i.e., small-scale outages downstream of larger-scale outages) will be more readily identified, thus enhancing the efficiency of job dispatch. Complete the integration of the MDMS and OMS to report the meters' power restoration events.	2021Q1	6/10/2022	1/23/2023	6 months

IV&V OVERVIEW

Scope

The scope of this IV&V effort was, broadly, PSEG Long Island's implementation of its OMS v6.7.8 and associated systems, sub-systems, and internal processes, including ESB, SCADA, and AMI. The scope included IV&V of all OMS-related recommendations from the ITF 30- and 90-Day Reports that were closed as part of the OMS upgrade to v6.7.8.

The OMS IV&V was conducted in two phases – Phase I, which concluded in July 2022, and Phase II, which concluded in May 2023. While the focus of this report is on Phase II, it incorporates Phase I Findings and Recommendations.

The **Phase I scope** included:

- Review of OMS design specifications, configurations, and interface implementations.

- Reviewing the design of PSEG Long Island's functional tests to ensure the tests are adequate to evaluate whether OMS v 6.7.8 complies with functional requirements.

- Running a sample of PSEG Long Island's functional tests to independently repeat and verify test results.

The **Phase II scope** included:

- Running all of PSEG Long Island's functional tests until all tests were successful.

- Independent ad-hoc testing, including Positive Testing, Negative Testing, Boundary Value Testing, and End-to-End Testing.

- Review of custom code written by PSEG Long Island and its consultants, including the implementation of the asynchronous queueing mechanism (async queue) for the ESB, and the duplicate outage detection logic.

- Monitoring and analysis of PSEG Long Island's performance tests.

- Review of PSEG Long Islands Performance Testing Storm Scenario and Data Model.

- Revise PSEG Long Islands Performance Testing Data Model to better capture expected storm scenarios.

- Independently run a Performance Test using the revised model.

Technical Approach and Methodology

To comprehensively validate and verify the OMS and related systems, the IV&V Team took a multi-pronged approach, which included the following key activities:

- **<u>Meetings</u>**

    The IV&V Team established a cadence of multiple weekly meetings with the PSEG Long Island technical leads, PSEG Long Island's consultants (Accenture), and other team members and contractors as needed. The meetings were used for progress

reporting, identification and discussion of technical and management issues, and for information gathering, ranging from factual clarifications to deep-dive discussions on specific areas.

- **Interviews**

The IV&V Team interviewed stakeholders from the business including OMS technical leads and support personnel, business owners, subject matter experts, system users, other PSEG Long Island and consultant technical resources, and select vendors (e.g., CGI, the OMS software vendor).

- **Document Reviews**

Document reviews ensure that key artifacts such as requirements, design specifications, test plans, test scripts, and test cases are properly constructed and meet industry-standard quality expectations.

To the extent that these were available, the IV&V Team reviewed business requirements documents, technical requirements documents, requirements traceability mapping documents, test plans, test scripts, test results, standard operating procedures, and operations runbooks, for relevance, completeness, and correctness.

- **Code Reviews**

Code reviews involve detailed review of programming code to ensure correctness of implementation. This applies especially to newly implemented code.

The IV&V Team reviewed custom code written by PSEG Long Island and its consultants for remediations/enhancements to implement specific Board Recommendations, including the implementation of the asynchronous queueing mechanism (async queue) for the ESB and duplicate outage detection logic, which were both newly introduced to the OMS for protecting it from heavy loads during future storms.

- **Analysis**

The IV&V Team conducted independent analysis of the systems and sub-systems, including extensive log analysis, to better understand routine functioning and observed issues.

- **Observation and Monitoring**

The IV&V Team monitored PSEG Long Island's performance tests from start to finish and observed walk-throughs of functional testing and operational procedures.

- **Functional Testing**

This category of IV&V testing ensures that the systems functional requirements are being satisfied. This consists of regression testing, testing of new functionality, and edge-case testing.

The IV&V Team obtained direct access to the systems, including the field devices used by the crews in the field, along with the test scripts developed and utilized by PSEG Long Island or its vendors. The IV&V Team ran the provided test scripts independently. In addition, the IV&V Team performed independent ad-hoc testing, including Positive Testing, Negative Testing, Boundary Value Testing, and End-to-End Testing. It should be noted that significant IV&V Team resources were deployed toward identifying defective test scripts, defective test data, and backward mapping of test scripts to functional and business requirements.

- **Performance (Stress) Testing**

Performance testing ensures that the system behaves robustly during high load as one would expect during severe storms.

The IV&V Team reviewed the existing data model and storm scenario used by PSEG Long Island for running various performance tests and worked with them to update the data model to better capture end user behavior as observed during past storms, as well as to capture AMI signals, which were not previously included. In addition to observing PSEG Long Islands performance tests, the IV&V Team conducted its own test.

Functional Testing Summary

PSEG Long Island's functional tests covered the following eight (8) domains:
1) Meter Operations (Meter Scripts) – 121 Test Cases
2) Overhead and Underground Operations (OHUG) – 48 Test Cases
3) ESD Operations for PGEO – 89 Test Cases
4) ESD Operations for PWEB – 45 Test Cases
5) ESD Operations for PLINE – 173 Test Cases
6) ESD Operations for PCAD – 78 Test Cases
7) ESD Operations for PFIELD – 30 Test Cases
8) ESB end-to-end regression testing – 61 Test Cases

In **Phase I**, the IV&V Team ran a sample of PSEG Long Island's functional tests in order to independently repeat and verify test results. **36% of the IV&V test runs of the PSEG Long Island test scripts failed. Many of the test failures were the result of inadequate documentation, poorly written test scripts, and scripts that plainly did not work.** The high rate of defective test scripts made it impossible to tell whether the OMS worked as it should.

In **Phase II,** the IV&V Team ran each of the functional test cases provided by PSEG Long Island, working through each of the failed test scripts until all issues were addressed. Failed tests were sent to PSEG Long Island team for resolution, and retested once PSEG Long Island reported the issue as fixed or provided updated test scripts, until each of the test

cases could be closed. Successfully completed functional testing was a pre-requisite for the IV&V Team's performance testing, to allow isolation of issues.

Out of a total of 644 functional test cases that the IV&V team attempted to run, 527 tests passed either in the first attempt or on a subsequent attempt after receiving either updated test cases or configuration settings from PSEG Long Island. 107 failed test case were removed by the PSEG Long Island team as they were determined to be obsolete and not used by the business team.[3] Three (3) failed tests were logged by the OMS product vendor, CGI, as defects. The remaining seven (7) failed tests, and one test case that could not be run, are awaiting re-enablement of the test phone number for making interactive voice response system calls, which could take a couple of months, per the vendor. The results are summarized in Figure 2.

Figure 2: Summary of OMS Functional Testing in 2022 and 2023

	Test Points	Tests Run	Pass %	*Failed to Run %
July	535	358 (67%)	229 (64%)	129 (36%)
September	642	581 (90%)	279 (48%)	302 (52%)
November	646	616 (95%)	421 (68%)	143 (23%)
December	646	645 (99%)	451 (70%)	141 (22%)
January	646	645 (99%)	463 (72%)	118 (18%)
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March	645	644 (99%)	526 (82%)	12 (2%)
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The most common reason for failure of test cases was that the steps described in the test cases were either not descriptive enough, had missing steps, did not declare prerequisites, or were referring to artifacts present in an older version of the OMS which had since been removed or altered in the OMS version 6.7.8.

In addition to running PSEG Long Island's test scripts, the IV&V Team conducted its own independent ad-hoc testing, including Positive Testing, Negative Testing, Boundary Value Testing, and End-to-End Testing.

Details of the IV&V Team's test management approach and test results for each domain are provided in Appendix A.

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[3] Note that PSEG Long Island should have identified and removed these 107 obsolete test cases, which they had indicated as passing, before LIPA IV&V, indicating the degree to which functional test scripts were not maintained and the maturity of the testing process.

Performance Testing Summary

The IV&V Team's scope included independently running a formal performance test to verify the behavior of the system in response to the high call and outage load that could be expected during a severe storm.

In preparation for its formal performance test, the IV&V Team first reviewed the existing data model used by PSEG Long Island for performance testing and ran a performance test using that model to verify system response and behavior. **The Team then identified opportunities for improvement and worked with PSEG Long Island to update the model to better reflect realistic scenarios that might be seen during severe storms.** Changes to the model included adding an additional 20% duplicate outage reporting to all digital channels to better capture customer behavior as observed during past storms; better alignment of the DSCADA signals with customer outage reports by using 15-minute buckets for reporting outages via LoadRunner scripts instead of 60-minute ones; and inclusion of AMI signals, which were not incorporated in the existing Isaias Storm data model.

The IV&V Team conducted a Dry Run performance test on January 12, 2023, using this updated 5-hour Performance Test data model. **As the test progressed, the Customer Manager Service of the OMS failed and the OMS stopped processing outage calls, resulting in a high call backlog (greater than 100K). Restarting the service did not resolve the issue. Subsequent review of the logs by CGI did not provide a tangible root cause of the failure.** PSEG Long Island and CGI deemed the root cause of the failure to be inconclusive from the software product perspective, as no defect or bug was found within the software; and PSEG Long Island concluded that the failure was a result of "traffic in the environment."

On April 27, 2023, the IV&V Team attempted to replicate the January 12 test in order to reproduce the issue, but the failure symptoms were not exhibited.

While the complete failure of the OMS only occurred during the January 12 test, a number of other tests conducted by PSEG Long Island experienced unexplained slow-downs in processing of reports and backlogs. These symptoms were not, however, observed in the majority of the tests conducted, and no root cause has been identified.

In light of the sporadic occurrence of the symptoms **(see Figure 3)** and given finite resources and time, the IV&V Team concluded that it is not cost-effective to continue trying to replicate the January 12 test in order to reproduce the OMS failure and help to identify the root cause. **However, in the absence of a clearly identified root cause, there remains a significant concern that the system may have a critical issue that is exhibiting intermittently and has the potential to cause another catastrophic failure of the OMS.**

Figure 3: Summary of OMS Performance Testing by LIPA or PSEG Long Island in 2023

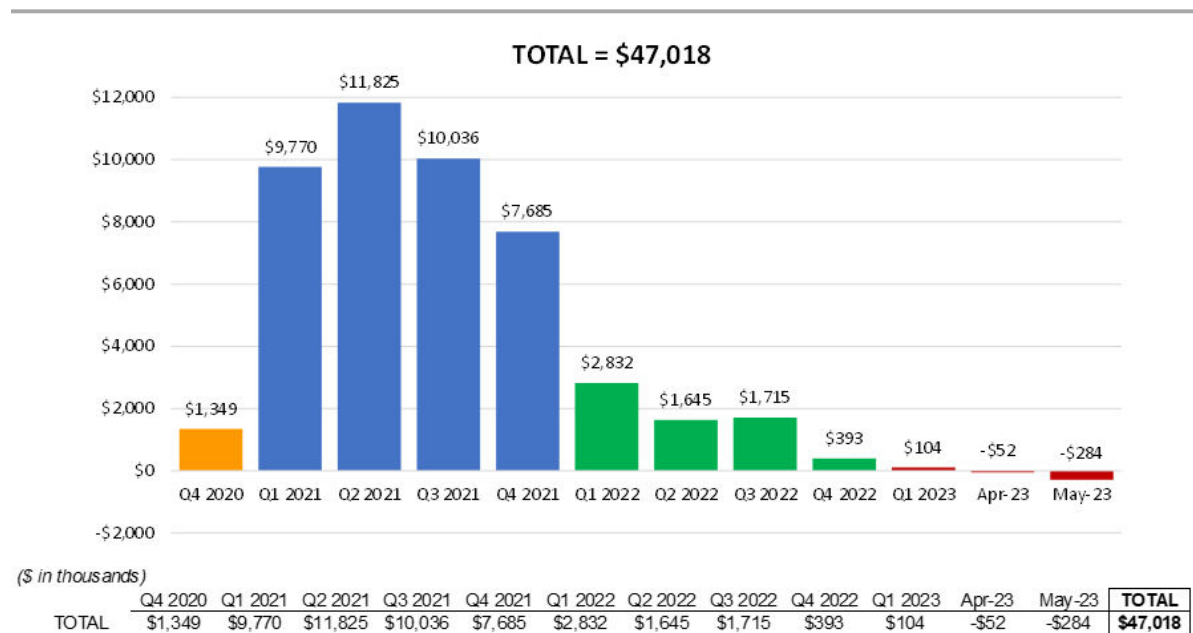| Date	Test	Outcome
Jan 12, 2023	LIPA executed a dry-run performance test simulating Isaias conditions.	OMS call processing module failed and could not be recovered => Overall test failed
Jan 18, 2023	LIPA re-executed its dry-run performance test simulating Isaias conditions.	Test passed without major hiccups
April 26, 2023	IV&V 5-Hour Performance Smoke Test	Test passed
April 27, 2023	IV&V 5-Hour Performance Smoke Test	Test passed
June 14, 2023	90% Customer Out DPS Formal Performance Test	OMS call processing module failed again, but was re-startable by rebooting services

FINDINGS AND OBSERVATIONS

Summary

PSEG Long Island finally has a working version of OMS with current software and hardware, after a long and expensive remediation and upgrade effort.

PSEG Long Island had great difficulty in managing the remediation processes for the OMS and customer communications systems. The unfortunate outcome of this deficiency is the length of time (> 2 years) and the amount of expenditure ($47 million) the remediation has consumed (see Figure 4). This demonstrates the need for better project management and tighter controls when managing vendors and consultants. Deficiencies in IT management controls such as planning, vendor management, cost management, and project management resulted in scope changes, protracted implementation schedules, and cost overruns.

Inadequate quality control has been a significant issue. PSEG Long Island did not follow mature IT practices in its functional and performance testing used to certify the OMS v 6.7.8 as ready for deployment. Deficient test planning, test script development and management, and test execution contributed to schedule and cost overruns, and reduced the effectiveness and reliability of the testing conducted by PSEG long Island. **Intermittent issues were common, which is evidence of unstable and uncontrolled environments.** Processes for requirements management, configuration management, and release management were also deficient, resulting in avoidable risks and issues.

Figure 4: Outage Management System Remediation Cost

TOTAL = $47,018

($ in thousands)

	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Apr-23	May-23	TOTAL
TOTAL	$1,349	$9,770	$11,825	$10,036	$7,685	$2,832	$1,645	$1,715	$393	$104	-$52	-$284	$47,018

Project Management Findings

Finding 1. Planning was deficient

Poor planning significantly hampered the remediation efforts, resulting in a number of avoidable delays. **PSEG Long Island repeatedly missed their own proposed end dates and proved unable to develop and adhere to a realistic schedule** (See Figure 1). Contingencies were not planned for; and activities that should have been anticipated were too often not. For instance, the installation of the new hardware was delayed because the data center had not been appropriately provisioned.

Finding 2. PSEG Long Island does not have sufficient internal technical resources

Inadequate internal technical expertise left PSEG Long Island overly reliant on vendors, without the knowledge base to effectively push for better vendor performance and results. Issue analysis and resolution was too often left almost entirely to the vendors, without robust initial troubleshooting and analysis by internal resources.

Finding 3. Vendor management was deficient

The over-reliance on vendors was aggravated by weak vendor management. Projects were largely vendor driven, with PSEG Long Island unable to exert sufficient control. There was often insufficient follow-up with vendors, allowing issues to get stale and fall off the vendor's radar. Vendor contracts tended to uniformly de-prioritize test environment issues, without consideration of the impact to production systems and projects. There was insufficient accountability for vendors, with no clear consequences for missing schedule, budget, scope, or quality control commitments.

Finding 4. Cost control and management was poor

The remediation efforts ended up costing an astounding $47 million through March 2023 (see Figure 4), on top of the costs of the initial failed OMS upgrade prior to Tropical Storm Isaias. Effective cost controls were lacking, and poor planning, weak vendor management, and inadequate quality control all contributed to the cost overruns.

Quality Control Findings

Finding 5. Test planning was deficient.

- Mistakes in mapping OMS functionality to the test objectives reduced the effectiveness and reliability of the testing conducted by PSEG long Island.

- The v6.7.8 OMS software differed from the previous v5.5 version in many ways, such as the user interface and arrangement of functionalities between various modules, but the test plan and the test scripts were not updated to align to the new version. Nor were they aligned to current business processes. This led to stale and unnecessary test cases being present, and the possibility of needed new test cases being missed (see Figure 2).

- The full suite of functional tests was not run for system updates. For each product update, the PSEG Long Island team ran only the test cases which had previously failed and were identified by the vendor as being fixed in the new build, instead of conducting a full regression test.

- Test environments were not appropriately backed up, contributing to challenges in consistently reproducing issues.

Finding 6. Test script development and management was deficient.

- **There was a lack of ownership of the OMS functional test scripts.** The IT team believed the test scripts were owned and managed by the business teams, while the business team believed that this responsibility belonged to the IT team.

- Many test cases were not documented accurately or completely. They relied upon the tester's implicit knowledge to execute the tests, which risks the reliability and repeatability of the tests.

- Many test cases did not specify the prerequisites, data sets, and configuration settings required to successfully and consistently execute the test.

- Test scripts for different areas were inconsistent and generally of poor quality, indicating a lack of training of the test case developers on standard practices.

- PSEG Long Island does not have a version control system in use for tracking the versions of test cases.

- PSEG Long Island does not maintain a control data set for conducting tests. This leads to uncertainty about where the root cause of a failure lies. It could be either the data that has uncovered an existing anomaly, or it could be a new fault introduced in a recent product or configuration update. This also leads to the non-repeatability of the test results.

- **PSEG Long Island does not have a system in use to track test runs and their results against the utilized test case versions, data, and configurations.** Instead,

Microsoft Excel is used for this purpose, which is prone to human error and lacks the in-built functionality of modern test management systems. This causes uncertainty as to what test scripts, test cases, and test data were used for validating the system.

Finding 7. Test execution was deficient.

- **Some test cases did not match the OMS system behavior but were marked as passed by PSEG Long Island based on implicit "understanding" that the functionality works.** These practices compromise the integrity of the test plan.
- **Poor coordination between different groups with respect to shared test environments led to failed or flawed performance tests.** For instance, in one case the ESB server was rebooted for maintenance while a DPS performance test was underway; and in another situation, a user logged out of the workstation running the DSCADA scripts driving an OMS performance test.

Finding 8. Requirements Management processes are inadequate.

- There is no requirements management system in use or robust internal process for managing requirements, to ensure that all requirements are logged, prioritized, updated, promoted for implementation and/or retired.

- Requirements Traceability Matrices (RTMs) were not consistently developed for all areas/sub-systems, and technical and functional requirements were sometimes incorrectly mapped in the RTMs that were available.

Finding 9. Configuration and Release Management processes are inadequate.

- There is no configuration management system or robust internal process in use for managing system configurations.

- There is no release management system or robust internal process in use to ensure that updates are consistently and correctly deployed in all environments.

- **There is no formal defined set of metrics/criteria for approving the promotion of any system release or change into production.** This has led to issues in production on more than one occasion. For example, a critical defect was identified in the OMS v 6.7.8 production system shortly after the go-live. While a temporary workaround was promptly implemented and PSEG Long Island worked with the vendor to obtain and deploy a fix soon after, the existence of the issue raised source control and change management concerns as it appeared to have been introduced after completion of regression testing.

Finding 10.   System and process documentation practices are poor.

PSEG Long Island's documentation of deployed systems was generally poor and demonstrated a lack of internal review processes and insufficient prioritization of critical system documentation. Key artifacts such as as-deployed Design and Architecture documents were often missing, out of date, or lacking sufficient detail. Initial versions of the Standard Operating Procedures and Runbooks for the newly implemented monitoring tools had significant gaps and took multiple revisions to get to acceptable levels. Comprehensive and current documentation of deployed systems is essential for effective Operations & Maintenance (O&M), and the lack of such documentation has contributed to significant delays in some upgrade projects.

OMS Stability and Performance Findings

Finding 11.   The root cause of the OMS failure during storm Isaias was not concretely identified, but the risk of occurrence was mitigated.

PSEG Long Island and the OMS product vendor, CGI, identified several issues that contributed to the deficient performance of the OMS during Tropical Storm Isaias, and implemented various fixes, optimizations, and settings and configuration changes to address them. However, **these were collectively insufficient to prevent a recurrence of the failures under Isaias-level loads, and a concrete root cause for the inability of the OMS to handle such loads was not identified.**

While it is concerning that PSEG Long Island and CGI were unable to identify the specific defect(s), the issue has been remediated by design changes at the ESB layer that reduce the volume of calls to the OMS and limit the rate at which they are sent to the OMS, which should prevent the OMS from experiencing the heavy load conditions under which the issues arose. Specifically, an asynchronous queueing mechanism (async queue) was implemented, which queues incoming reports to the OMS and provides throttling of the rate at which they are sent to the OMS to protect the system from overloading. Additionally, duplicate outage detection logic significantly reduced the incoming data load to the OMS by filtering out all repeat calls from the same customer, irrespective of digital channel, if the outage is already known to OMS via either SCADA or a prior customer contact.

Finding 12.   Some performance tests have exhibited sporadic, non-reproducible, and potentially critical issues

At least three of the performance tests conducted by PSEG Long Island or the IV&V Team have exhibited unexplained and non-reproducible slowdowns and backlogs in the processing of outage reports, including a January 12, 2023 test in which the OMS

stopped processing outage reports completely. PSEG Long Island and the OMS product vendor, CGI, have deemed the root cause of the failure of the OMS during the January 12, 2023, test to be inconclusive from the software product perspective, as no defect or bug was found within the software; and PSEG Long Island has concluded that the failure was a result of "traffic in the environment". **The IV&V Team does not consider this a satisfactory conclusion, especially given that the unexpected slowdowns and backlogs have been exhibited more than once.**

The IV&V Team re-ran the January 12th performance test on April 27, 2023, in order to reproduce the issue, but was not able to observe the failure symptoms during the test. Unfortunately, deficiencies in test environment management and backups create uncertainty as to the extent to whether the January 12th system was accurately replicated for the April 27th test.

In light of the sporadic occurrence of the symptoms (see Figure 3) and given finite resources and time, the IV&V Team has concluded that it is not cost-effective to pursue this test again. **However, in the absence of a clearly identified root cause, there remains a significant concern that the system may have a critical issue that is exhibiting intermittently and has the potential to cause another catastrophic failure of the OMS.**

RECOMMENDATIONS

Recommendations

The IV&V Team has the following recommendations based on its findings and observations.

A. Governance

IT governance is defined as the processes that ensure the effective and efficient use of IT in enabling an organization to achieve its goals. IT governance provides a structure for aligning IT strategy with business strategy. PSEG Long Island should develop effective governance frameworks through the creation of policies and a compliance and controls framework. Periodic audit activities are also required to monitor and validate performance, which provides feedback related to compliance. The IV&V Team understands that, in many cases, informal governance policies exist but they are not consistently applied or enforced. These governance polices should be developed under an industry-recognized framework such as CMMI or COBIT.

- **Recommendation 1: PSEG Long Island should develop clear and documented policies on IT systems governance. The application and enforcement of these policies must be charged on PSEG Long Island staff, not consultants.**

- **Recommendation 2: Business ownership of the systems should be guard-railed by clear and well-enforced policies. System implementation projects should be driven by genuine PSEG Long Island/LIPA specific business cases and requirements and not by a "follow what New Jersey is doing" mantra. Customizations should be limited to the very essentials. Priorities should be well understood from a business and risk-management point of view and not by way of blanket categories (e.g., "production issues" get prioritized irrespective of impact).**

B. Training

We have found that PSEG Long Island line personnel are dedicated and devoted to the task at hand and have always prioritized the interest of Long Island customers. However, many of the deficiencies that we have observed arise from lack of adequate training in their respective subject matter areas. For example, it is evident that the testing process and the quality of the artifacts could have been far better streamlined if there was consistent training to the business SMEs on the "do's and don'ts" of test scripting and execution.

- **Recommendation 3: PSEG Long Island should develop a comprehensive training program for its technical and line of business staff in the following areas:**
  - a. **Technology project management**
  - b. **Vendor management**
  - c. **Requirements engineering and management**
  - d. **Configuration management**
  - e. **System documentation best practices**

    f.   **Test management (including test design, scripting, automation, metrics and test environment management**

C.   Staffing and Employee Retention

PSEG Long Island relies on a handful of key staff to manage this critical system. It is very important to maintain and improve the team's skillset.

- **Recommendation 4: PSEG Long Island should prioritize proactive employee recruitment strategies and reduce dependence on consultants by hiring more permanent staff.**

- **Recommendation 5: PSEG Long Island should be more proactive in employee retention. Recognize the critical role the current team has assumed in the remediation effort. Ensure that the technical knowledge is not lost by formal documentation and knowledge-sharing initiatives. Expand the size of this team to cross-train and shift reliance from consultants to more permanent staff.**

D.   Vendor Management

PSEG Long Island currently relies on external consultants for many support activities. We encourage this practice when the requirements are short-term and the vendors are appropriately qualified. However, vendors need to be proactively managed to ensure that the actions and work plan are aligned and appropriate accountability is obtained. The IV&V Team recommends the following:

- **Recommendation 6: PSEG Long Island should develop an enterprise-wide vendor management policy to establish clear performance expectations and accountability. This vendor management process should move away from engaging the same handful of vendors for every task by instead engaging those that are most qualified and cost-effective based on competitive screening. The vendor management governance structure should be composed of both IT and business management and hold vendors accountable not just for activities and deliverables but for outcomes and schedule compliance.**

E.   Long term planning

PSEG Long Island's planning activities around outage management systems needs to be more deliberative with a long-term horizon rather than focused on annual budget development. The IV&V Team recommends the following in this area:

- **Recommendation 7: PSEG Long Island should develop a long-term plan around the future of the current OMS system. This plan should take into account the current system's strengths and shortcomings, market analysis of alternative systems, clear articulation of the major business objectives in a future-state system, including tradeoffs, and how the system will fit in the context of the overall ADMS/SmartGrid strategy that PSEG Long Island and LIPA have adopted.**

F.   Process Improvements

The IV&V Team has identified several areas of process improvements, many of them critical to managing a complex and mission-critical system such as an OMS.

- **Recommendation 8: PSEG Long Island should use formal tracking of issues (in one place) using ITIL practices. The IV&V Team has noted that important items are inexplicably dropped from issue reporting documents provided to the IV&V Team. While these are often explained away as unintentional failures, a formal tracking system will be helpful in preventing such oversight.**

- **Recommendation 9: PSEG Long Island should automate functional testing. PSEG Long Island should embark on a test automation initiative that, initially, aims to automate a large portion of the regression testing scripts. Over time, this practice should be extended to all system development practice areas across the enterprise. Test automation will benefit the efficiency and effectiveness of system implementation projects in all areas. A robust test management and automation initiatives will include tools that facilitate requirements and traceability management, test management, test automations, release and configuration management.**

- **Recommendation 10: PSEG Long Island should develop focused project management processes. Much of the templated project management processes that PSEG Long Island is in the process of implementing have been flowing down from New Jersey and lack genuine ownership in Long Island. It is important to ensure that these project management processes are responsive to Long Island needs and not just check-the-box exercises for the technical staff.**

G.   Business Continuity Plans

The IV&V Team continues to have concerns about the effectiveness of the OMS-related business continuity plans.

- **Recommendation 11: PSEG Long Island should expand on the current Business Continuity Plans to make sure that they are consistent with the following industry best practices:**
  a. **The BCP needs to be traceable to a thorough and robust Business Impact Analysis (BIA) study. The objective of the BIA should be to identify the very critical business processes that will be needed to support essential business activities during an OMS failure and make sure that customer communication and restoration activities can proceed at an acceptable pace.**
  b. **Once critical processes are identified the BCPs should have detailed procedures (including activation criteria) that will enable the organization to effectively transition and operate under the BCP work plan.**
  c. **The BCP should also address processes to resume normal operation when the OMS system is functional again, including resynchronization of operational data.**

H.   IT Quality Control and Assurance

Robust Quality Control and Assurance is essential to ensuring that IT systems meet business requirements, function as intended, and provide the expected outcomes; are secure and stable; and maintain data integrity. Effective quality control and assurance processes will also reduce unplanned work and re-work and help maintain adherence to project schedules and budgets.

- **Recommendation 12. PSEG Long Island should review all their existing functional test scripts and re-test each script until all the tests pass on a "repeatable" basis.**

- **Recommendation 13. PSEG Long Island should focus on improving test management practices, which will involve staff training and appropriate use of Software Development Life Cycle (SDLC) and test management tools**

- **Recommendation 14. PSEG Long Island should ensure that system, integration, and user acceptance testing follows a defined cadence and is organized accordingly.**
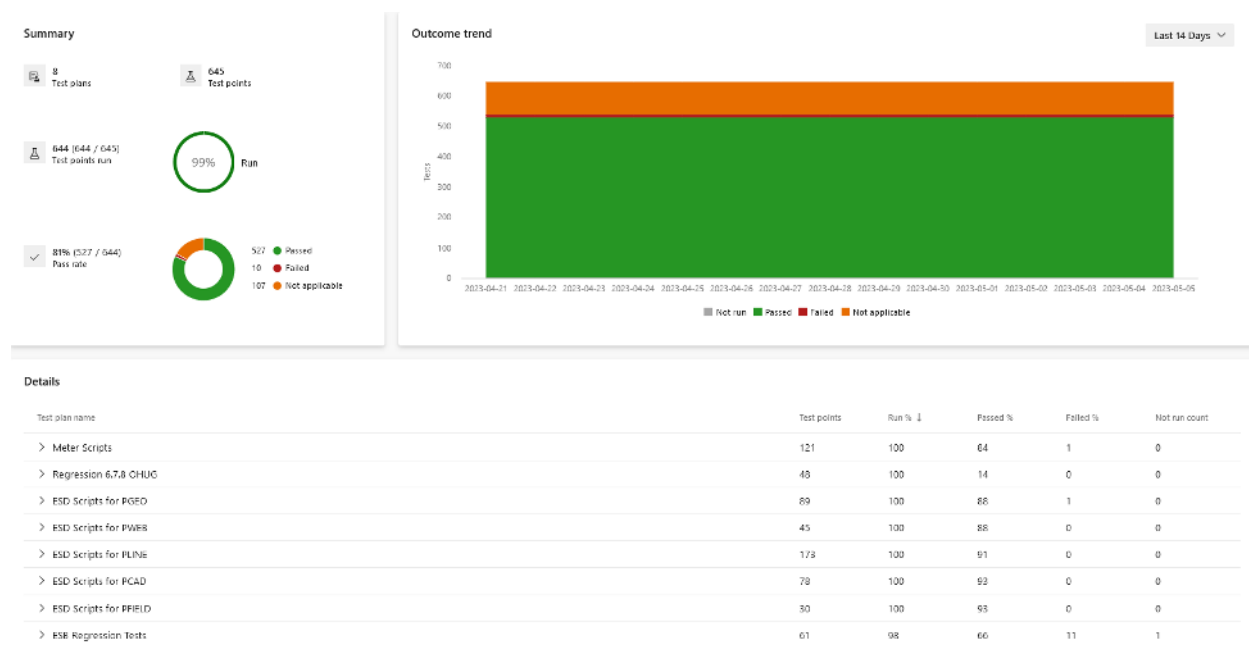
APPENDIX A: FUNCTIONAL TESTING DETAILED RESULTS

This section provides additional details on the IV&V Team's test management approach and the test results by domain.

Test Management and Reporting

The IV&V Team used Azure DevOps platform for managing the IV&V effort. This platform allows for automatic versioning, test plan management, execution and reporting. The functional regression tests were uploaded onto this platform and then executed using its test case execution interface. This interface allows for step-by-step recording of the results along with capture of optional screenshots and video recording of the test run. During the test case execution, the IV&V team recorded the test results using this interface. Identified defects were reported on a periodic basis to the PSEG Long Island team.

When PSEG Long Island notified the IV&V Team that the defect was resolved and ready to be retested, the IV&V Team retested the defect and updated the results in Azure DevOps.

| Test plan name	Test points	Run % ↓	Passed %	Failed %	Not run count
> Meter Scripts	121	100	64	1	0
> Regression 6,7,8 OHUG	48	100	14	0	0
> ESD Scripts for PGEO	89	100	88	1	0
> ESD Scripts for PWEB	45	100	88	0	0
> ESD Scripts for PLINE	173	100	91	0	0
> ESD Scripts for PCAD	78	100	93	0	0
> ESD Scripts for PFIELD	30	100	93	0	0
> ESB Regression Tests	61	98	66	11	1

The IV&V team found a few OMS functional errors outside of the regression test cases provided by PSEG Long Island. Several of these were known issues with the product and were not considered critical. For example, allowing an operator to set the ETR for an outage in the past. While absurd, the application allows that.

Meter Operations (Meter Scripts)

There were a total of 121 functional test cases in this domain. Many of the test cases involved working on the main frame for creating jobs and for verifying their completion. Among these test cases, there were 22 test cases that involved SAS reporting infrastructure.

The meter scripts were some of the most poorly written test cases. Most test cases did not specify the pre-requisites and simply assumed that the tester would know them just by reading the test title. The steps did

Meter Scripts - Chart

121

- Passed
- Not applicable
- Failed

17
102
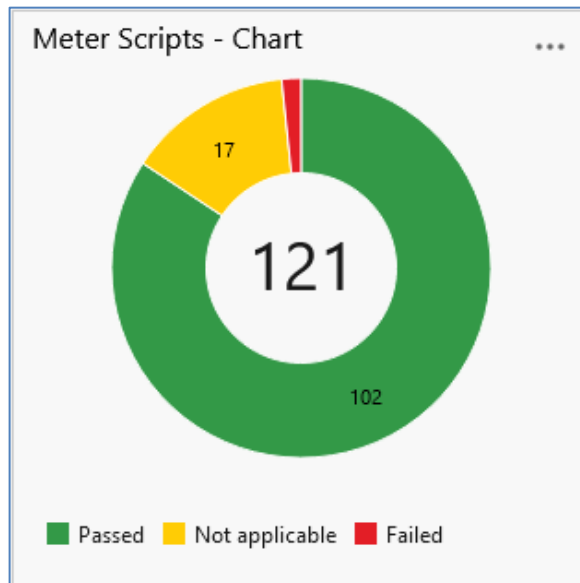
not include the detailed main frame commands or the customer accounts which were to be used for the tests such that it met the test's requirements.

After the initial first pass on its attempt to run the meter scripts, the IV&V team rejected most of them for lack of clarity, detailed steps and/or test data. It took PSEG Long Island more than two months to update the meter scripts and give them back to the IV&V team for retesting. This excluded the tests involving SAS reporting. Since the SAS infrastructure in the RP Test environment was not available until February 2023, these test scripts were updated early in 2023 and then executed in February-April 2023 timeframe.

Seventeen tests were deemed not applicable or obsolete by PSEG Long Island when they were submitted as failed to run by the IV&V team. Two failed tests were opened as bugs against the OMS product vendor, CGI.

Overhead and Underground (OHUG)

Regression 6.7.8 OHUG - Chart

48

7

41

- Not applicable
- Passed
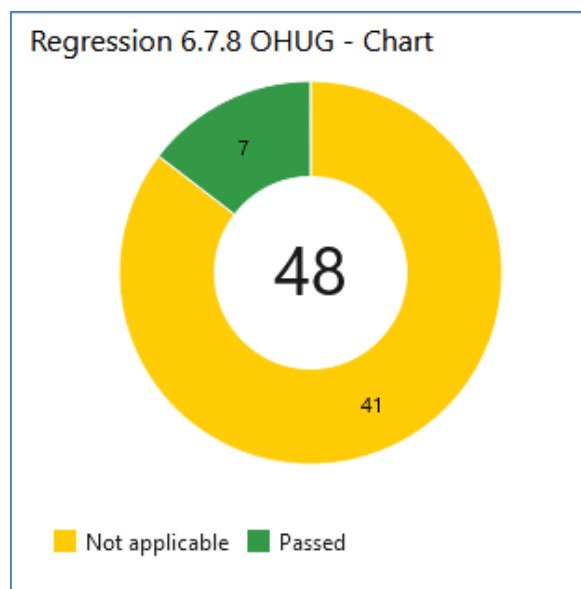
There were a total of 48 functional tests in this domain. Many of the test cases involved working with SAP system for creating jobs and for verifying their completion.

Almost all the OHUG tests were ill-documented and failed to run on the first try. A number of joint working sessions were held with PSEG Long Island personnel in order to make them run successfully. This too wasn't successful since it turned out that the person at PSEG Long Island who had run these tests last had already retired and no one else knew how to make them run.

PSEG Long Island also reported that the OHUG business unit does not use the SAP-OMS integration, which is what these test cases were trying to test. In fact, they have never used it. **They have always used a paper-based approach where jobs created in SAP and printed out and handed over to the crew who would then manually enter them into the OMS so that the field crew could be dispatched and the work could be tracked and updated.**

This state of affair is indicative of major lack of communication between business and technology teams. No one in the technology team knew why the business team preferred a paper-based process when the SAP/OMS integration was already in place and was tested successfully previously. What was missing was not known. How to make the system attractive to the business team? No one knew either.

In the end, we decided to treat the failed to run test cases as removed since they were not used by business anymore.

The final tally was out of the 48 tests, 41 were removed and 7 passed successfully.
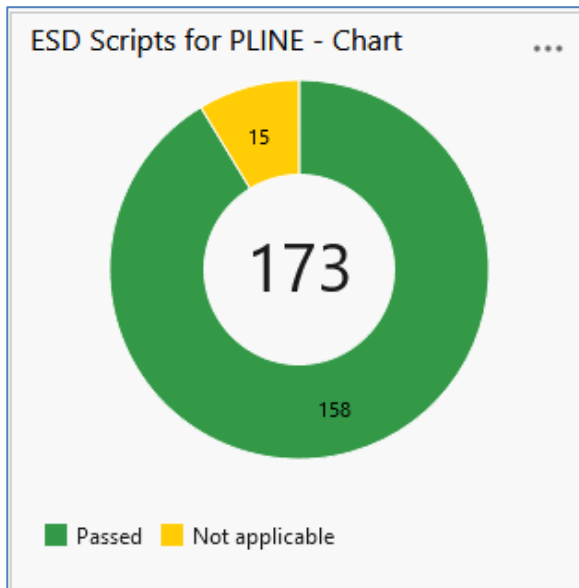
ESD Scripts for PGEO
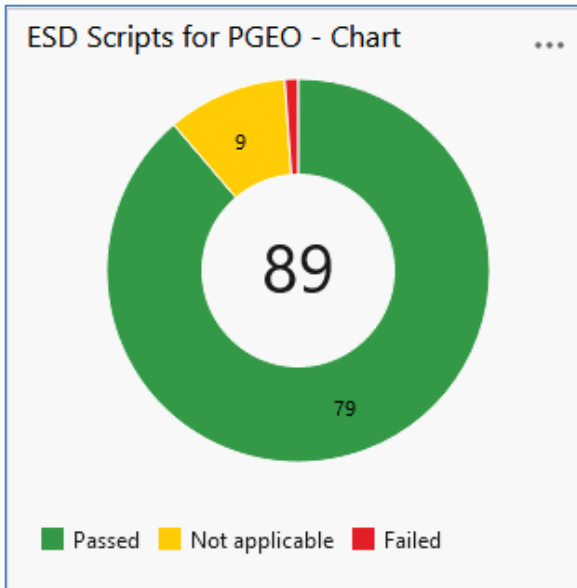
There were a total of 89 test cases in this domain. After a number of updates and working sessions with PSEG Long Island team, the IV&V team was able to pass 79 of them. The PSEG Long Island team concluded that the remaining 9 failing test cases were now obsolete and hence they were marked Not Applicable or Removed. One test case remained in the failed category and it was assigned to CGI as a product bug and a Jira Ticket was opened to track it.
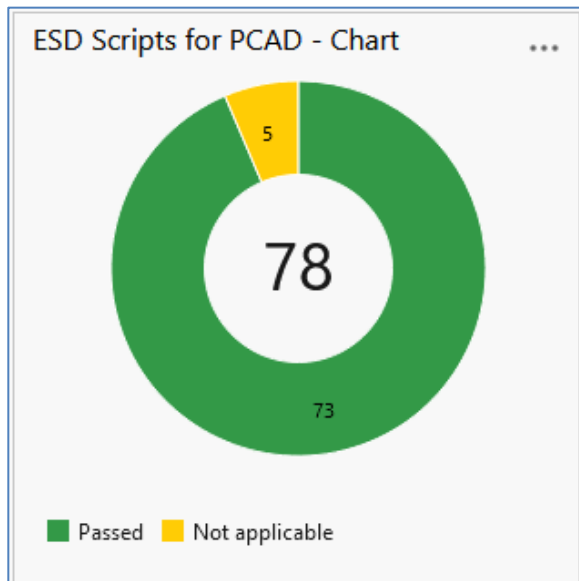
ESD Scripts for PWEB
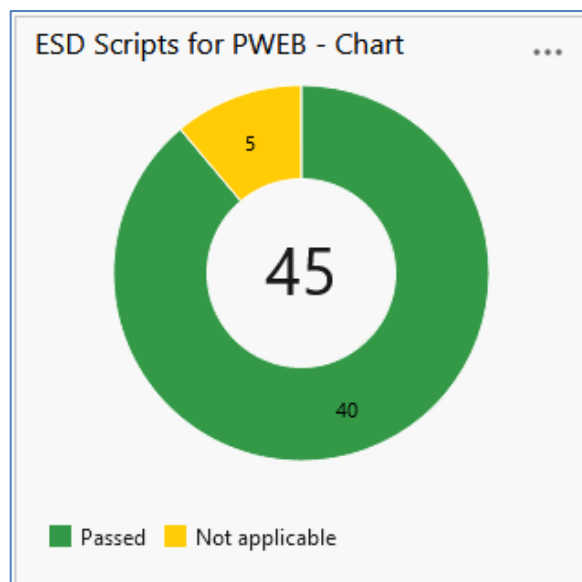
There were 45 test cases in this domain. After a number of updates and working sessions with PSEG Long Island team, the IV&V team was able to pass 40 of them. The PSEG Long Island team, concluded that the remaining 5 failing test cases were now obsolete and hence they were marked Not Applicable or Removed.

ESD Scripts for PLINE

ESD Scripts for PLINE - Chart · · ·
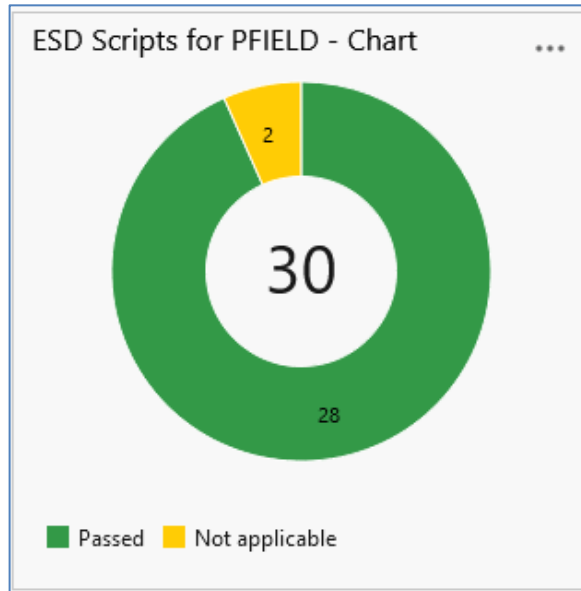
15

173

158

■ Passed ■ Not applicable

There were 173 test cases in this domain. After a number of updates and working sessions with PSEG Long Island team, the IV&V team was able to pass 158 of them. The PSEG Long Island team concluded that the remaining 15 failing test cases were now obsolete and hence they were marked Not Applicable or Removed.

ESD Scripts for PCAD

ESD Scripts for PCAD - Chart · · ·
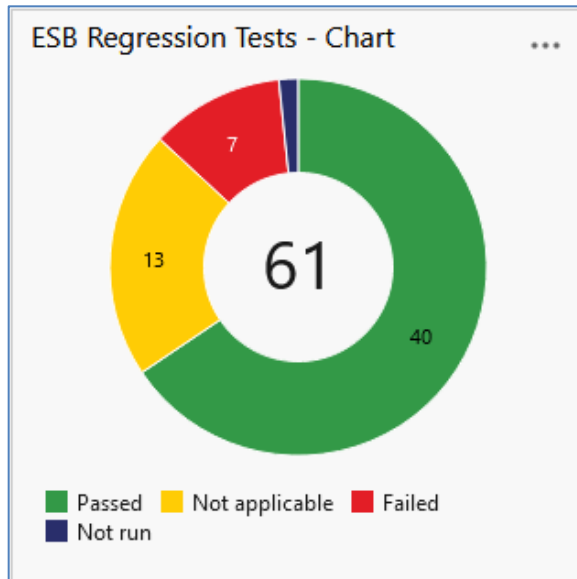
5

78

73

■ Passed ■ Not applicable

There were 78 test cases in this domain. After a number of updates and working sessions with PSEG Long Island team, the IV&V team was able to pass 73 of them. The PSEG Long Island team concluded that the remaining 5 failing test cases were now obsolete and hence they were marked Not Applicable or Removed.

ESD Scripts for PFIELD

ESD Scripts for PFIELD - Chart   ...

30

28

2

■ Passed   ■ Not applicable

There were 30 test cases in this domain. After a number of updates and working sessions with PSEG Long Island team, the IV&V team was able to pass 28 of them. The PSEG Long Island team concluded that the remaining 2 failing test cases were now obsolete and hence they were marked Not Applicable or Removed.

ESB Regression Tests

ESB Regression Tests - Chart   ...

61

40

13

7

■ Passed   ■ Not applicable   ■ Failed
■ Not run

There were 61 test cases in this domain. After a number of updates and working sessions with PSEG Long Island team, the IV&V team was able to pass 40 of them. The PSEG Long Island team concluded that 13 of the remaining 21 failing test cases were now obsolete and hence they were marked Not Applicable or Removed. The remaining 8 test cases (7 previously failed ones and 1 which could not be tried) are awaiting restoration of the Intrado IVR test toll free number in order to be retried. As per Intrado, this may take a couple of months.

LIPA
Long Island Power Authority

lipower.org